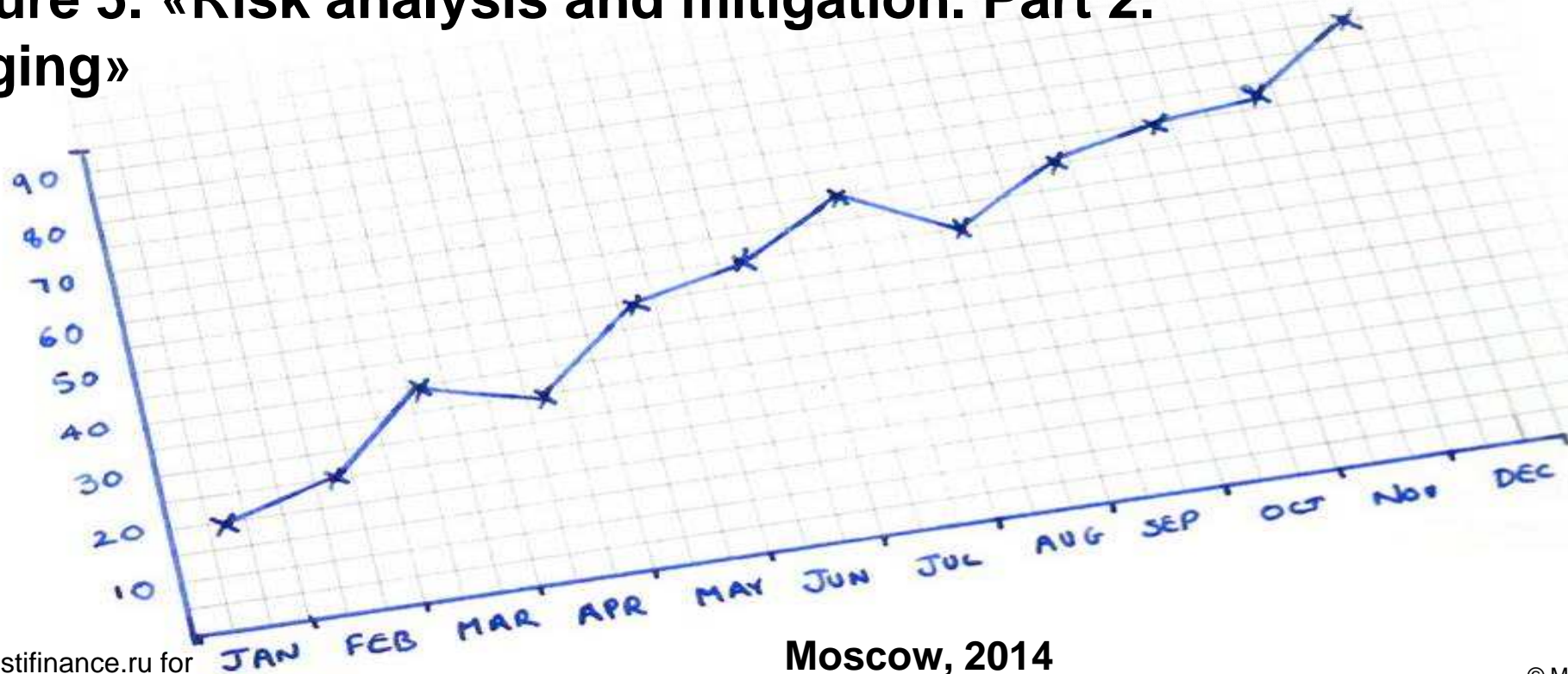


Investment Project Management

Lecture 5. «Risk analysis and mitigation. Part 2. Hedging»



Moscow, 2014

What's the risk?

The **risk** is:

➔ An exposure to the possibility of loss, injury, or other adverse or unwelcome circumstance;

➔ A chance or situation involving a possibility of loss, injury, or other adverse or unwelcome circumstance.

The generic **consequence** of the risk is **losing of** entire **value** or its share.

The risks are inclined to be as follows types:

- Technogenetics;
- Natural;
- Political;
- Economical;
- Commercial;
- Social;
- Ecological;
- Professional, etc.

We consider the particular case of Commercial risks – the **Financial** Ones. And only those which can be mitigated with **financial instruments**.

Key risks which can be mitigated with financial instruments

- Price risk
- Currency risk
- Interest rate risk
- Counterparty default risk
- Risk of default/lost value of the security

If your hedging operation are aimed to cover the actual risks of your business you're the **HEDGER**.



If your hedging operation are aimed to earn money you're the **SPECULATOR**.



Price risks. Futures

Futures — is a standardized forward purchase contract linked to **underlying asset** which is traded in the **Stock/Commodities Exchange**. Futures have only one condition to be agreed: the **Strike price**. All other conditions are standard and fixed in the Exchange rules. All the accounts and payments are committed inside the Exchange.

Forward — is a purchase contract which includes any deferred payments or delivery.



Price risks. Futures

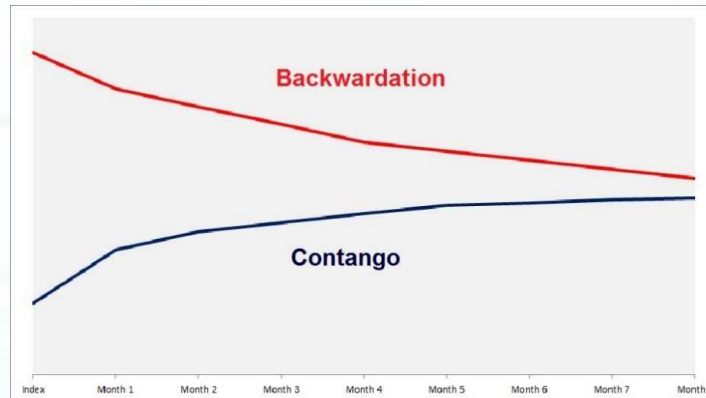
Futures types:

With Physical delivery – with mandatory delivery of the underlying asset to the Buyer. If not delivered the Supplier pays a penalty.

With Cash settlement (Regular futures) – no delivery, the netting of counterparties' mutual obligations is provided by the Stock/Commodities Exchange by the funds kept on parties' accounts. The (non-delivery) Futures contracts are concluded by the customer with the **Exchange** (not with other customer!!!).

Strike price is a underlying asset price fixed in Futures/Option agreement. **Spot price** — is a current market price of the nearest futures on underlying asset.

If the spot price is lower than the remote (further) futures price, the situation is called **contango**. If it's higher – the situation is named **backwardation**.



Price risks. Futures

The Futures is **bought (long position)** at the Strike-price USD 100. It means that the asset is bought in the future for USD 100.

The future has come.

The spot price is USD 80. Buyer's **loss** is USD 20 because right now the asset can be bought in the market for USD 80 and immediately sold to the Buyer for USD 100.

The spot price is USD 130. Buyer's **profit** is USD 30. Because the current price is higher than the fixed one.

The Futures is **sold (short position)** no Strike-price USD 100. It means that the asset is sold in the future for USD 100.

The future has come.

The spot price is USD 80. Seller's **profit** is USD 20. The Exchange has a liability to buy the asset at the price higher than the current one.

The spot price is USD 130. Seller's **loss** is USD 30. Because the current price is higher than the fixed one and the Seller has to sell the asset cheaper than it was fixed

Price risks. Futures

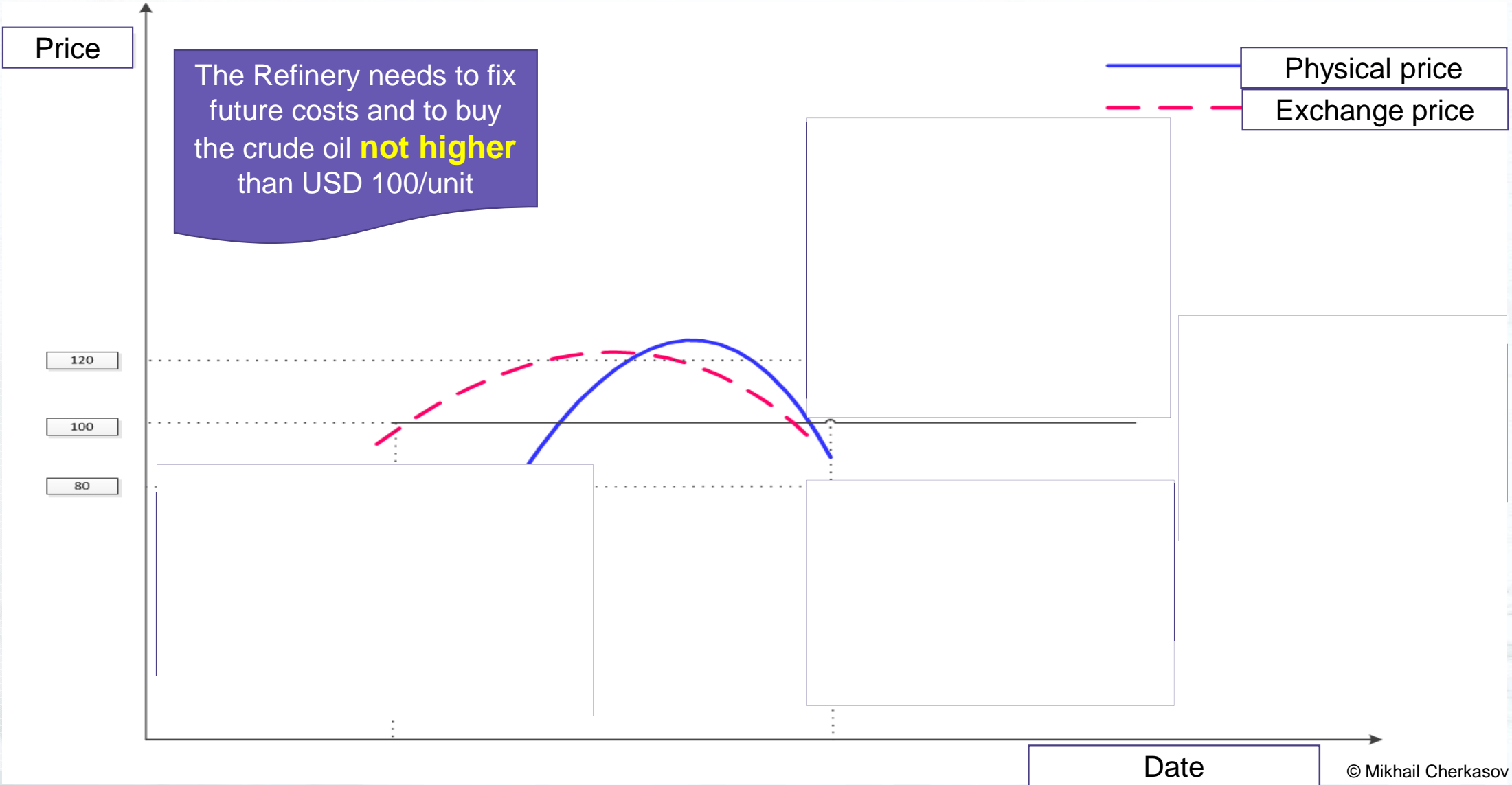
I've got an asset,
I'd like to **SELL**

SELL
futures

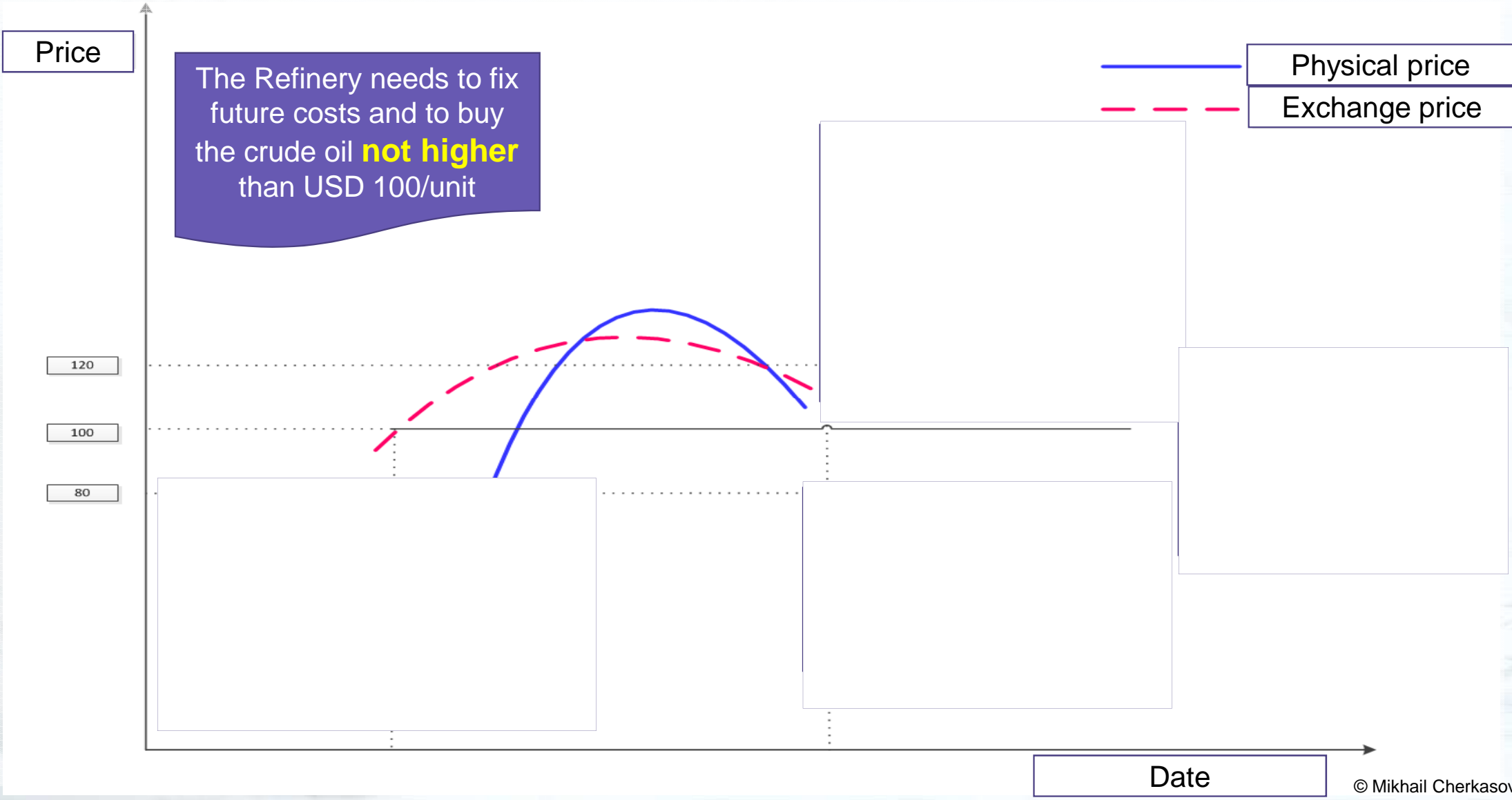
I need an asset,
I'd like to **BUY**

BUY
futures

Price risks. Futures



Price risks. Futures



Price risks. Futures

Margin requirements of the Stock/Commodity Exchange — it's an array of the reserves (own funds of the Investor) deposited on the accounts opened with a Broker. The reserves are demanded by the Exchange in the amounts established for coverage of risks sourced by Investor's opened positions.

- 1. Performance bond** – represents either own Investor's funds, or Bank guarantee, or the loan given by the Broker. The performance bond covers the aggregate Investor's position.
- 2. Initial margin** – is the minimal coverage of risks demanded when any position opens.
- 3. Maintenance margin** – is the difference between the Initial Margin and current position valuation. Also named "**Variation margin**".

The Hedgers and Speculators are imposed to reserve very different norms of margin. As well, there're transactional costs charged by the Exchange for each transaction (quite small). **Margin Call** – is a demand of additional margin payment when the position value is getting lower than already reserved funds. **Margin release** – represents the back repayment of exceeding margin when the position value is going up.



Price risks. Futures

Margin requirements calculation. Long position:

Crude Oil WTI (NYMEX) (16/10/2013) Futures – Nov 2013. Strike price – USD 101,36/bbl. Initial margin – USD 4'510 (4,47 %). Maintenance margin – USD 4'100 (4,06%). The margin requirements are given for 1 standard contract (1000 barrels). The Hedger **BUYS** 10 contracts (**long position**).

Total amount of the position = $10 * 101,36 * 1000 = \text{USD } 1'013'600$.

If the Investor is recognized as a Hedger the **performance bond** (permanent deposit) is to be (~ 10% of total possible operation amount) = USD 100'000.

The **Initial margin** (at the position opening) = $4510 * 10 = 45'100$. The initial margin is blocked from the amount of the performance bond. (The deposit balance = USD 54'900).

The maximal **spot price** when the **margin call** appears = $\text{Strike price} * (1 - \% \text{ Initial margin}) / (1 - \% \text{ Maintenance margin})$.

$101,36 * (1 - 4,47\%) / (1 - 4,06\%) = 100,573$. The fall of the spot price for **0,8 USD/bbl** causes a margin call!!!

Price risks. Futures. Long margin calculation

The critical value of December, 2013 Futures price, when the Company gets the margin call, USD/brl	94,83			Number of contracts	10	
Buy Futures (long) (expiry date - 15.12.2013)		March	April	July	September	December
NYMEX Futures price (Dec., 2013) per 1 barrel of LSCO/WTI, USD/barrel, bought on 01.03.2013	95,26	95,26	97,00	88,00	89,00	99,00
Total value of the position, USD		952 600	970 000	880 000	890 000	990 000
Margin account, beginning of period, USD	45 100	45 100	45 100	45 100	45 100	45 100
Minimal Margin account balance allowed by NYMEX, USD	41 000					
The negative gap between Critical value and current NYMEX quote for respected contract, USD/brl (Fall of the price)		0,43	2,17	-6,83	-5,83	4,17
Margin call, USD Total amount		0	0	64 216	54 216	0
Subaccount (Margin call account) for coverage of the negative gap, USD beginning of period		0	0	0	64 216	54 216
Cash inflow/outflow on the Margin call account, USD		0	0	64 216	-10 000	-54 216
Subaccount (Margin call account) for coverage of the negative gap, USD end of period		0	0	64 216	54 216	0
Total balance of the both accounts (Margin account + Margin call account), USD		45 100	45 100	109 316	99 316	45 100

Price risks. Futures

Margin requirements calculation. Short position:

Crude Oil WTI (NYMEX) (16/10/2013) Futures – Nov 2013. Strike price – USD 101,36/bbl. Initial margin – USD 4'510 (4,47 %). Maintenance margin – USD 4'100 (4,06%). The margin requirements are given for 1 standard contract (1000 barrels). The Hedger **SELLS** 10 contracts (**short position**).

Total amount of the position = $10 * 101,36 * 1000 = \text{USD } 1'013'600$.

If the Investor is recognized as a Hedger the **performance bond** (permanent deposit) is to be (~ 10% of total possible operation amount) = USD 100'000.

The **Initial margin** (at the position opening) = $4510 * 10 = 45'100$. The initial margin is blocked from the amount of the performance bond. (The deposit balance = USD 54'900).

The minimal **spot price** when the **margin call** appears = $\text{Strike price} * (1 + \% \text{ Initial margin}) / (1 + \% \text{ Maintenance margin})$.

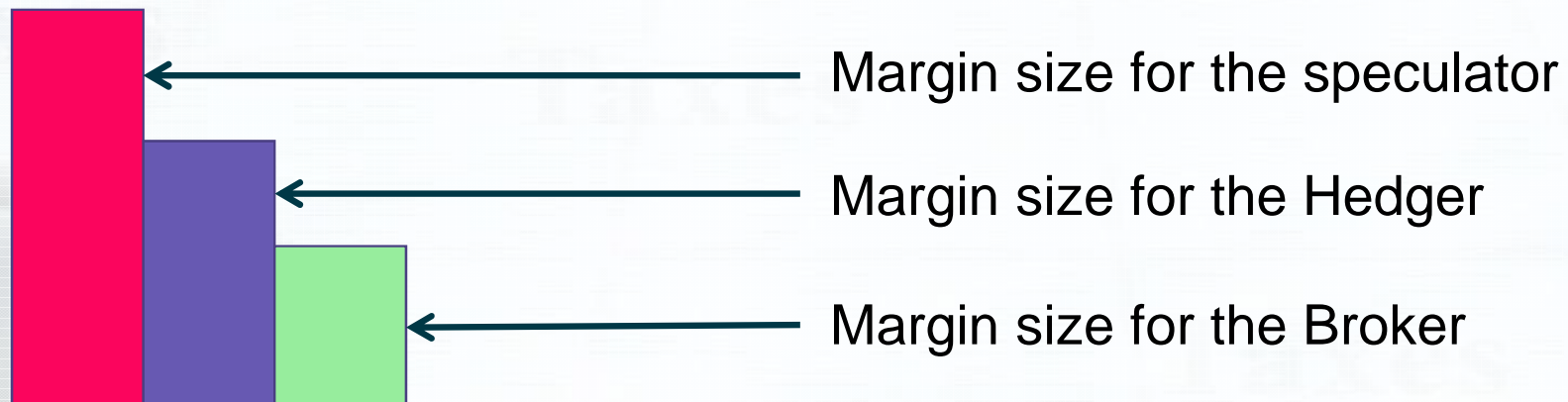
$101,36 * (1 + 4,47\%) / (1 + 4,06\%) = 101,78$. The raise of the spot price for **0,42 USD**/bbl causes a margin call!!!

Price risks. Futures. Short margin calculation

The critical value of December, 2013 Futures price, when the Company gets the margin call, USD/brl	95,65			Number of contracts	10	
Sell Futures (Short) (expiry date - 15.12.2013)		March	April	July	September	December
NYMEX Futures price (Dec., 2013) per 1 barrel of LSCO/WTI, USD/barrel, sold on 01.03.2013	95,26	95,26	97,00	88,00	89,00	99,00
Total value of the position, USD		952 600	970 000	880 000	890 000	990 000
Margin account, beginning of period, USD	45 100	45 100	45 100	45 100	45 100	45 100
Minimal Margin account balance allowed by NYMEX, USD	41 000					
The negative gap between Critical value and current NYMEX quote for respected contract, USD/brl (Increase of the price)		0,39	-1,35	7,65	6,65	-3,35
Margin call, USD Total amount		0	9 369	0	0	29 369
Subaccount (Margin call account) for coverage of the negative gap, USD beginning of period		0	0	9 369	0	0
Cash inflow/outflow on the Margin call account, USD		0	9 369	-9 369	0	29 369
Subaccount (Margin call account) for coverage of the negative gap, USD end of period		0	9 369	0	0	29 369
Total balance of the both accounts (Margin account + Margin call account), USD		45 100	54 469	45 100	45 100	74 469

Price risks. Futures

The Exchange establishes **DAILY** the requirements of all types of margin for the Brokers, Hedgers and Speculators. Margin size has no direct link to the spot price – it fully depends on **volatility** of the certain futures.



Given samples are based on margin requirements established for the Brokers. The actual requirements for the customers are established by Brokers in higher amounts.

Price risks. Options

Option (Latin **optio** – choice, judgment) — is a contract which gives the Buyer (the holder) **the right**, but not the obligation!!!, to buy or sell an underlying asset or instrument at a specified Strike Price on or before a specified date. The Seller has the corresponding obligation to fulfill the transaction – that is to sell or buy – if the Buyer (holder) "exercises" the option. The Buyer pays a **Premium** to the seller for this right.

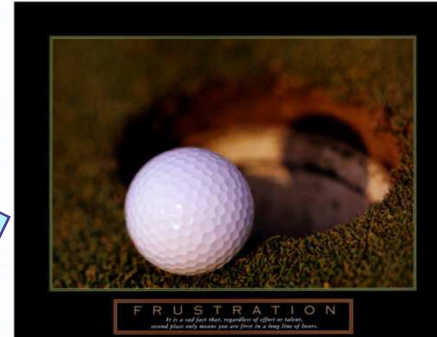
There are the options for **selling** (**PUT option**) and **buying** (**CALL option**) of Underlying asset. The Options traded on the Stock/Commodities Exchange are linked to the Futures (not to the real asset price). The Exchange Options are standardized as well as Futures. The agreement between 2 parties fixes only the Premium amount and the **Strike Price**. There's a substantial distinction between the Option and the Futures – the Option is a contract between the Buyer and the Seller **directly**. The Exchange is not a part of the contract – it just controls it's execution and guarantees the creditability of the Option Seller. Option **Settlement** – is a situation when the Buyer presents the Option at sight (**Exercise**) and the Seller executes his obligation.

Price risks. Options



A Buyer has a **RIGHT** to Buy/Sell an Asset in the future

Does not exercise the right



If the Spot Price doesn't reach a needed level

Pays Premium

Exercises the right



If the Spot Price reaches a needed level



A Seller has an **OBLIGATION** to Buy/Sell an Asset in the future at the Strike price

Price risks. Options

To BUY an Option – means
to acquire a **RIGHT**



To SELL an Option –
means to acquire a
OBLIGATION



Price risks. Options



PUT – «положить», to offer the Asset for sale

A RIGHT to **SELL**

**PUT
Option**

Price risks. Options



CALL –
«приглашать»,
«вызывать»,
«выкликать», to
demand the
Asset



A RIGHT to **BUY**

**CALL
Option**

Price risks. Options

	CALL	PUT
BUY	To acquire a right to BUY an Asset	To acquire a right to SELL an Asset
SELL	To acquire an obligation to SELL an Asset	To acquire an obligation to BUY an Asset

Price risks. Options. Low risk hedging

I've got an Asset.
I'd like to
SELL

**I BUY
PUT**

The right to SELL the
Asset

I need an Asset.
I'd like to
BUY

**I BUY
PUT**

The right to BUY the
Asset

The lowest risk is when you **BUY an
Option** PUT/CALL.

Price risks. Options. High risk hedging

I've got an Asset.
I'd like to
SELL

**I SELL
CALL**

The obligation to
SELL the Asset

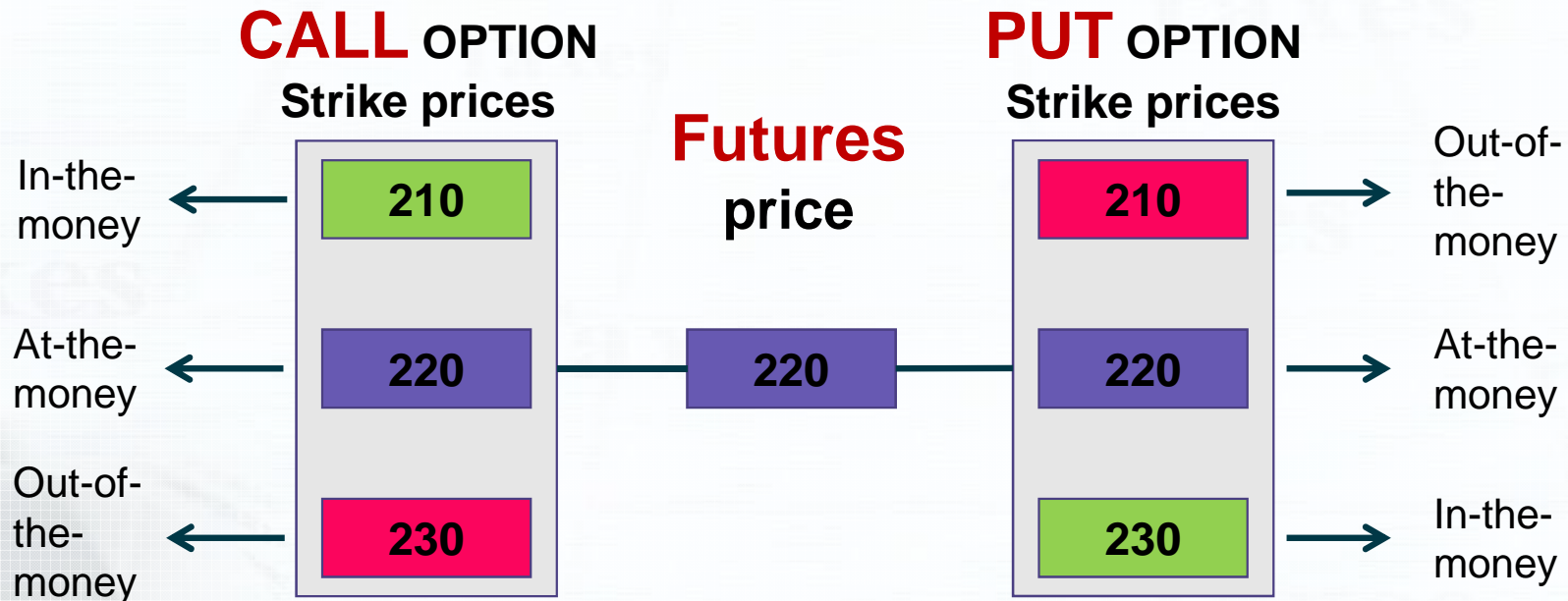
I need an Asset.
I'd like to
BUY

**I SELL
PUT**

The obligation to BUY
the Asset

When you **SELL an Option** you adopt
the high risk. But you get a **premium**

Price risks. Options



According to the current **FUTURES** Price the Options CALL & PUT have the alternate (opposite) Value.

Price risks. Option types

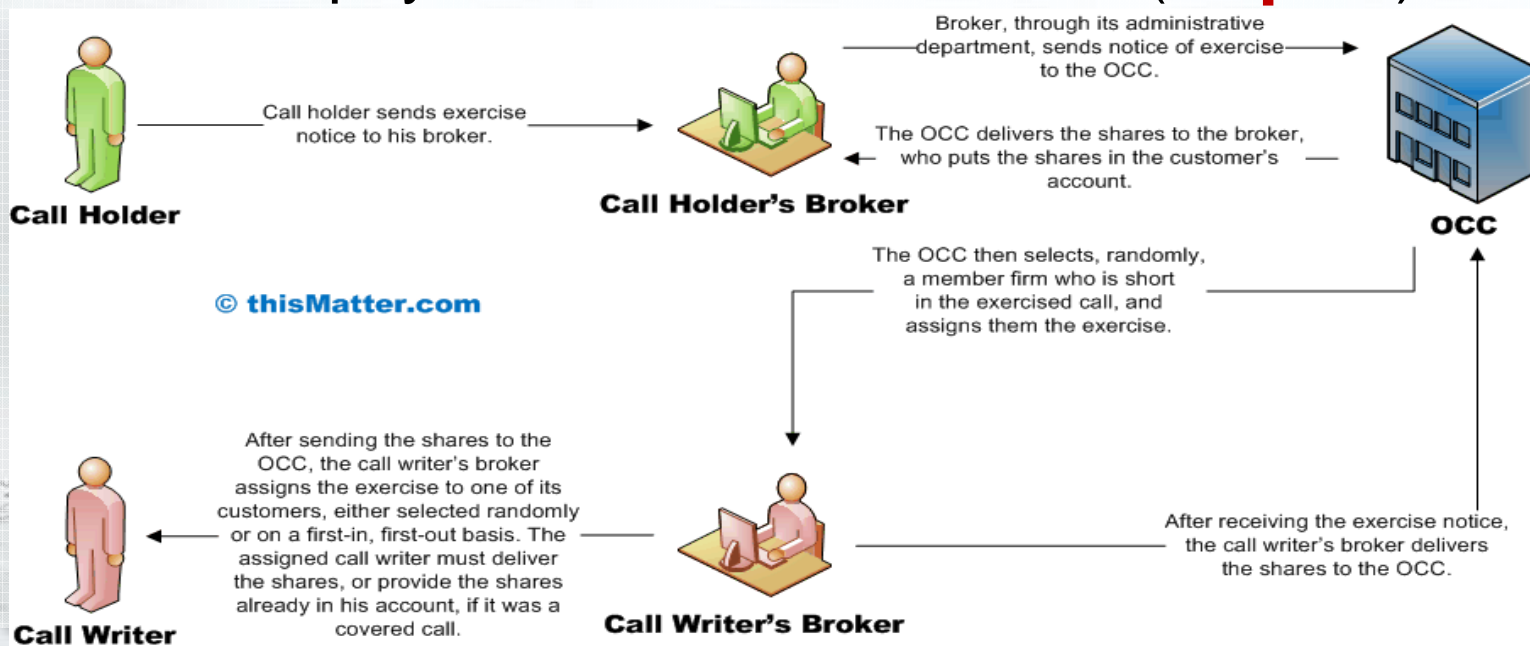
- **Exchange Traded** Option linked to Exchange Futures;
 - **Over-The-Counter (OTC)** Option (non-Exchange traded) linked to any asset;
-
- **European** – the Settlement is possible only at exact date;
 - **American** – the Settlement is possible at any moment till the expiry date;
 - **Bermudan** – the Settlement is possible at several exact dates within the period till the expiry date;
 - **Asian** – the Settlement is made with using of Asset average price for the period;
 - **Barrier** – the Settlement is possible only if the Price has overcome the definite level;
 - **Binary** – the Settlement is possible only if the definite event has occurred. For instance: Equity Default SWAP – the Holder gets the settlement if the definite share has fallen in the public market for more than 50% of its initial (at the moment of Option issuance) price;
-
- **Exotic** – the Option focused on the array of several conditions. Example: Call-on-call – Compound option (Structured option).
 - **Vanilla** – any “boring”, non-exotic Option.

Price risks. Options

Scenarios of Option life cycle:

You're an Option Buyer. You may:

- ➊ To **Exercise** – to enforce the Seller to execute his obligation;
- ➋ To **Offset** – to close the position by selling the Option at any current price to the third party;
- ➌ To wait till the expiry date without settlement (**Expire**).

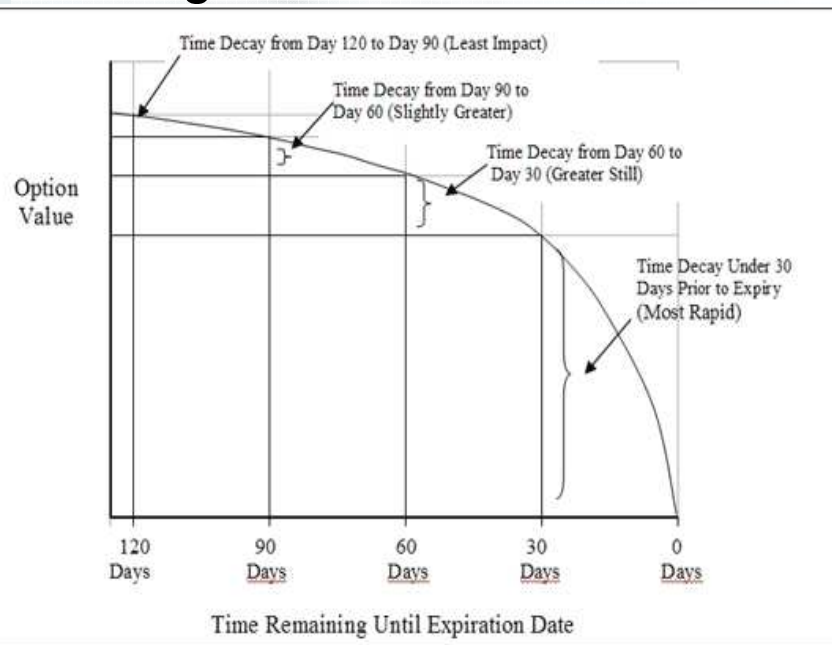
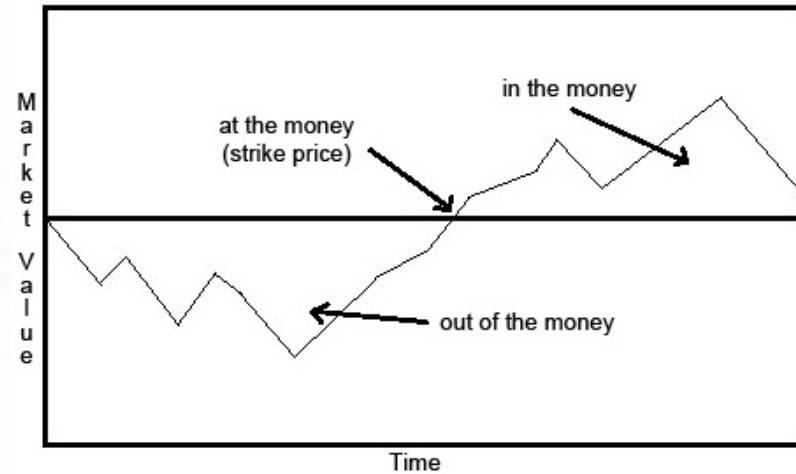


Price risks. Options

Option status within the period of its life:

- **Out-Of-The-Money;**
- **At-The-Money;**
- **In-The-Money, Moneyness.**

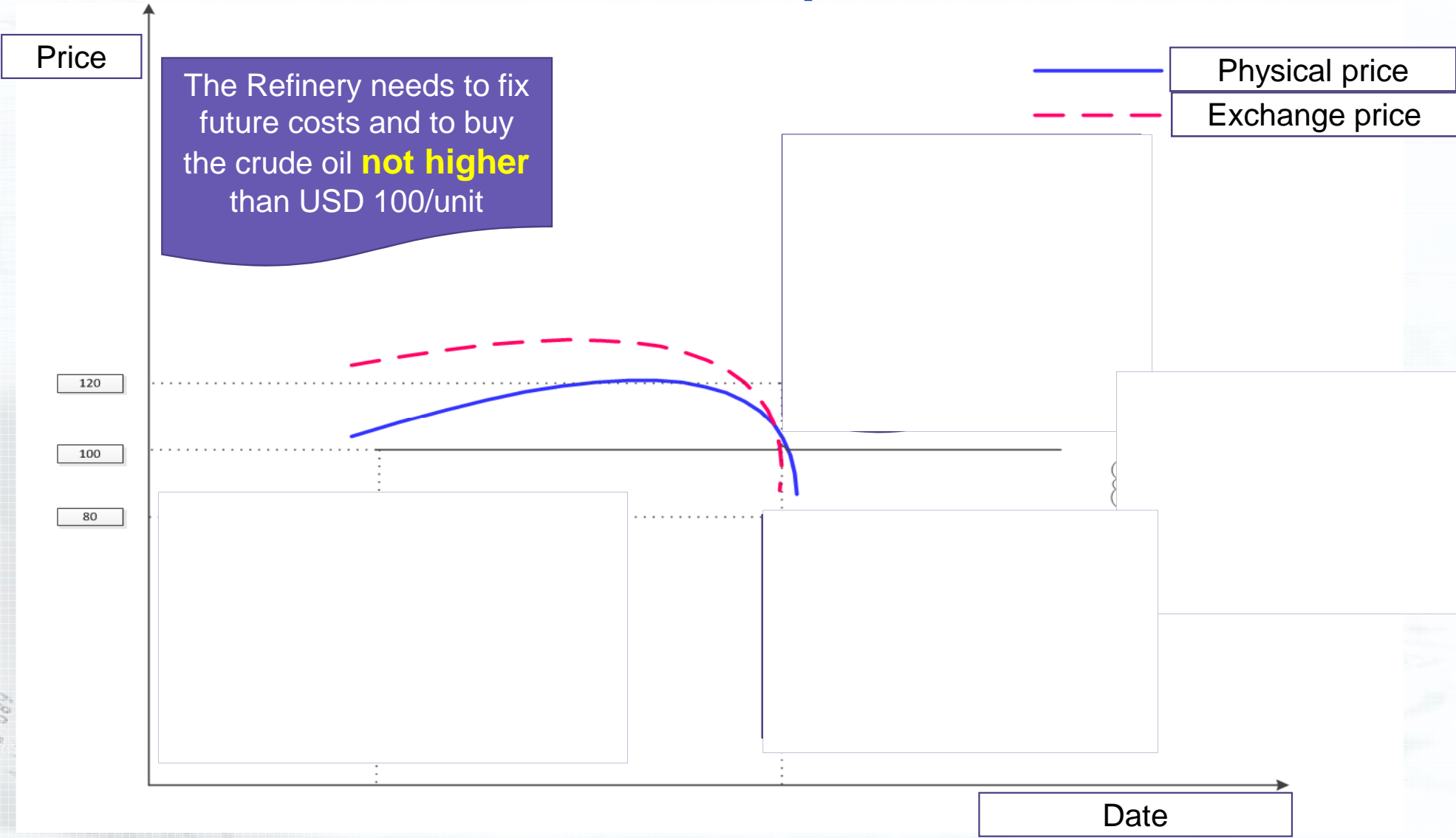
When the Option is located within the zone In-The-Money, the Seller gets a **Margin Call** from the Exchange.



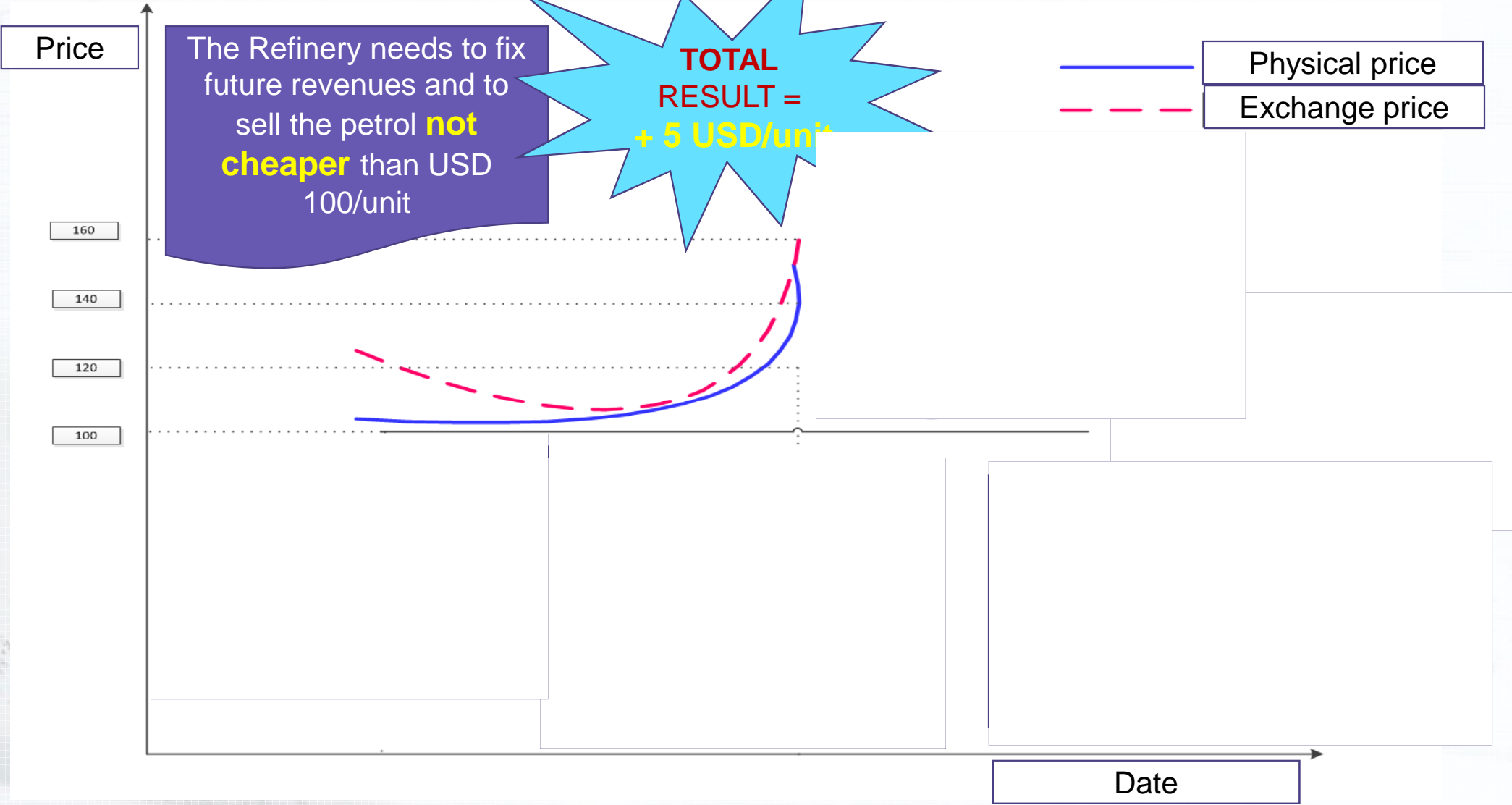
As times goes by closer to the Option **Expiration Date**, its real Value is decreasing (Option **Time Decay**).



Price risks. Options



Price risks, Options



Stock / Commodities Exchange. How it works?

Chicago
Board of
Trade (CBOT,
CME Group)



Customer

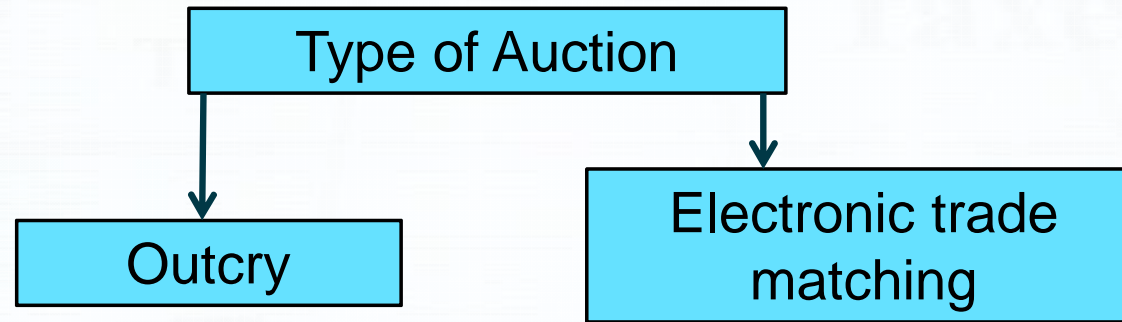
Middleman

Broker

Exchange

Stock / Commodities Exchange. How it works?

Chicago
Board of
Trade (CBOT,
CME Group)



Brokers-members of 3 main sections – **RED jackets**;
Brokers-members of emerging markets section – **ORANGE jackets**;
Everyone has (exactly!!!) the badge with Large-scale **NAMES**. If something wrong happens there's a special investigation service named "Out-trade". Out-trade representatives wear – **pale GREEN jackets**. The Exchange staff wears **BLUE jackets**. The staff of brokerage houses – **GOLD jackets**.



Stock / Commodities Exchange. How it works?

Chicago
Board of
Trade (CBOT,
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